

Pacemaker Infection- How should We Manage it?

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Pacemaker is being used routinely since 1960s for the treatment of bradyarrhythmia. First pacemaker implantation in Bangladesh was done in NICVD in 1981. Rate of pacemaker implantation has increased worldwide as well as in Bangladesh. Pacemaker infection is an uncommon but serious complication. The incidence of pacemaker infection varies in different studies depending on the population studied and the time period. Overall it is less than 2%.¹ The infection rate is increasing in recent time. A recent analysis of US data showed that infection rate grew from 1.61% in 1993 to 2.41% in 2008; possibly due to two factors: ageing of population and presence of more comorbid conditions.² The interval between pacemaker implantation or revision and the onset of infection varies widely, from days to years.³ It can manifest as infection of the generator ("box") pocket, the leads and can also involve endocardial structures. Although most infections have been limited to the pocket, frank PPM endocarditis accounts for approximately 10% of PPM infections. Implantable cardiac electronic devices (ICED) infections now comprise approximately 10% of all endocarditis cases.

Patient-related factors responsible for pacemaker infection include diabetes mellitus, congestive heart failure, chronic renal failure, long-term use of corticosteroids, patients with existing central lines such as dialysis lines, patients on anticoagulants, and, may be, most importantly patients with a fever within 24 h of implantation. Procedural factors include longer procedure time, operative inexperience, use of temporary pacing leads, dual- or triple-chamber devices, lack of antibiotic prophylaxis, and development of post-operative pocket

haematomas.⁴ In our socioeconomic status we use preprocedural temporary pacing more commonly; and the prolong time interval between temporary pacing and permanent pacemaker implantation may be responsible for more pacemaker infection in our setting. All-cause mortality following pacemaker infection is considerable, ranging from 5%-29%.

The best treatment of pacemaker infections is to prevent them. Different guidelines have recommended different measures for prevention like i) Bathing or showering of patient with soap before the procedure ii) Use of prophylactic intravenous antibiotic routinely and specified time before the procedure (1 hour for Cefazolin and 90-120 min for Vancomycin) iii) Use of specific operation theatre wear for the patient, operating team and all the stuffs iv) Keeping staff number and movements to a minimum v) Aseptic technique during the implantation vi) Adequate haemostasis to prevent pocket haematoma. These recommendations should be strictly followed. As approximately half of all device infections are caused by methicillin-resistant staphylococci, it is justifiable and probably preferable to use vancomycin prophylaxis, instead of cephalosporin.

Regarding diagnosis of the pacemaker infection, clinical features like skin erosion, pocket infection, fever and features of infective endocarditis should be looked for. For every patient with suspected or established pacemaker infection, blood culture, transthoracic and transesophageal echocardiography should be done routinely along with culture of lead tip and pocket tissue. Transesophageal echocardiography is essential to diagnose valvular lesion and

pacemaker lead vegetations. Intracardiac echocardiography has got a higher diagnostic accuracy in comparison to transthoracic and transesophageal echocardiography.⁵

For management of pacemaker infection, both pacemaker and device should be explanted in all cases except when there is only superficial or skin line infection without involvement of device or lead. Erosion of any part of the pacemaker should imply contamination of the entire system, including the intravascular portion of leads, and complete device removal should be performed. This explantation procedure involves significant risks, including cardiac tamponade, pulmonary embolism and death, even in experienced hands. Thus, it is suggested that only high-volume centers with appropriate facilities and training can perform these procedures relatively safely, with a high rate of success.⁶ Surgical removal of the device is an option specially when there is large vegetation in pacemaker lead, endocardium or valvular structure, and percutaneous removal of lead is not possible. Epicardial implantation of pacemaker can be done at the same time. Long term antibiotic therapy without device and lead removal is not recommended. It is recommended only in patients with limited life expectancy (very sick, old and frail patients with number of comorbidities) or when patient refuses removal of the device.

The antibiotic therapy for pacemaker infection also depends on the type of infection and type of microorganism. It varies from 10-14 days for only pocket infection to 4-6 weeks in case of bacteremia, endocarditis and other complicated conditions. Necessity of reimplantation should be revised in every case. 50% of patients will not require a new device.⁷ Reimplantation of the device should be done after specific time period like, 7 days for non-bacteremia patients and 14 days for bacteremia patients and patients with infective endocarditis. In patients with bacteremia, blood culture should remain negative for at least 72 hours before reimplantation. Though some studies showed safety of same day

reimplantation specially when there is only pocket infection, it is not recommended. Lead extraction procedure and debridement can cause significant bacteraemia leading to repeated infection of the device, if reimplanted on the same day. The replacement should be done on the contralateral side and if not possible, epicardial pacing should be tried.⁵

There are several aspects of pacemaker infection management that needs further studies and recommendations. These include whether the infected pocket site should be closed before new device placement, and how to manage patients who have undergone device removal but have a remaining lead remnant. Patients with bloodstream infection and no localizing evidence of either generator-site infection or lead or endocardial involvement represent a difficult management group. In Bangladesh, we sometime try to sterilize the device to reuse it. Though there are different studies and metaanalysis supporting the reuse of devices, there is no such recommendation of reusing the infected devices after sterilization. Guidelines advocated not reusing infected devices even after sterilization.⁵

Other than the morbidity and mortality of the patient, the economic impact of pacemaker infection should also be considered. Precise data regarding the actual healthcare burden of pacemaker infections are not available and are sorely needed. Considering the acquisition costs of pacemaker, it is not surprising that the economic consequences, including healthcare resource utilization, of pacemaker infections are substantial.⁸

The diagnosis and in medical & surgical treatment of pacemaker infection is a complex one, which needs knowledge, skill and patience of both physician & patient. But it is essential to reduce the morbidity and mortality of the patients. Because the incidence of pacemaker infection is relatively low, the exposure that most physicians have to this situation is inadequate. Therefore, it is important to prepare a team of physicians and staff who have this experience to handle the situation when the need arises.

References:

1. Poole JE, Gleva MJ, Mela T et al. Complication rates associated with pacemaker or implantable cardioverter-defibrillator generator replacements and upgrade procedures: results from the REPLACE registry. *Circulation* 2010; 122: 1553-1561.
2. Voigt A, Shalaby A, Saba S. Rising rates of cardiac rhythm management device infections in the United States: 1996 through 2003. *J Am Coll Cardiol* 2006;48(3):590-591.
3. Sohail MR, Uslan DZ, Khan AH, et al. Management and outcome of permanent pacemaker and implantable cardioverter defibrillator infections. *J Am Coll Cardiol* 2007;49:1851-1859.
4. Sohail MR, Uslan DZ, Khan AH et al. Risk factor analysis of permanent pacemaker infection. *Clin Infect Dis* 2007;45:166-173.
5. Baddour LM, Epstein AE, Erickson CC et al. Update on Cardiovascular Implantable Electronic Device Infections and Their Management A Scientific Statement From the American Heart Association Endorsed by the Heart Rhythm Society. *Circulation* 2010;121:458-477.
6. Farooqi FM, Talsania S, Hamid S, et al. Extraction of cardiac rhythm devices: indications, techniques and outcomes for the removal of pacemaker and defibrillator leads. *Int J Clin Pract* 2010;64:1140-1147.
7. Tarakji KG, Chan EJ, Cantillon DJ et al. Cardiac implantable electronic device infections: presentation, management, and patient outcomes. *Heart Rhythm* 2010;7:1043-1047
8. Darouiche R. Treatment of infections associated with surgical implants. *N Engl J Med* 2004;350:1422-1429.